CLAIMS:

1. A method for making a three-dimensional object comprising the steps of:

building an object from a polymeric or wax modeling material using a layered manufacturing rapid prototyping technique; and

smoothing an object surface by exposing the object to vapors of a solvent that transiently softens the modeling material.

2. The method of claim 1, wherein the layered manufacturing technique is fused deposition modeling.

3. The method of claim 1, where the modeling material is a thermoplastic resin.

4. The method of claim 3, wherein the thermoplastic resin comprises at least about 50 weight percent of an amorphous thermoplastic selected from the group consisting of ABS, polycarbonate, polyphenylsulfone, polysulfone, polystyrene, polyphenylene ether, amorphous polyamides, acrylics, poly(2-ethyl-2-oxazoline), and blends thereof.

5. The method of claim 4, wherein the solvent is selected from the group consisting of methylene chloride, an n-Propyl bromide solution, perchloroethylene, trichloroethylene, and a hydrofluorocarbon fluid.

6. The method of claim 1, wherein the modeling material is selected from the group consisting of thermoplastics, green metals dispersed in a polymeric binder, green ceramics dispersed in a polymeric binder, and jetting wax.

7. The method of claim 6, wherein the modeling material is glass-filled nylon.

8. The method of claim 1, and further comprising the step of:

selecting a length of time during which the object is to be exposed to the solvent vapors as a function of

concentration of the solvent vapors, prior to the smoothing step.

9. The method of claim 8, and further comprising the step of:

reducing the concentration of solvent vapors so that the selected exposure time will increase.

10. The method of claim 1, and further comprising the step of:

masking selected portions of the object surface with a substance that will inhibit smoothing of the selected portions, prior to the step of smoothing the object surface.

11. The method of claim 10, wherein the masking substance is applied using an automatic process.

12. The method of claim 11, wherein the automatic process is a jetting process.

13. The method of claim 11, wherein the automatic process is a fused deposition modeling process.

14. The method of claim 11, and further comprising the step of:

identifying the selected portions of the object surface for masking accordingly to their geometry.

15. The method of claim 14, and further comprising the step of:

identifying the selected portions of the object surface for masking accordingly to their radii of curvature.

16. The method of claim 11, and further comprising the step of:

identifying the selected portions of the object surface using a software algorithm that creates a digital representation of the surface area to be protected.

17. The method of claim 16, wherein digital data identifying the surface area to be protected is stored in an .stl file.

18. The method of claim 1, and further comprising the step of:

creating a digital mask of selected portions of the object surface for which smoothing is not desired, using a haptic input interface.

19. The method of claim 1, wherein the building step comprises pre-distorting certain object features so that said features will obtain a desired geometry following the smoothing step.

20. The method of claim 19, and further comprising the steps of:

providing an initial object representation in a digital format, the initial object representation having a surface geometry; and

modifying the initial object representation to pre-distort certain features of the surface geometry, producing a modified object representation;

wherein the object built in the building step has a geometry defined according to the modified object representation; and

wherein the desired geometry attained following the smoothing step approximately matches that of the initial object representation.

21. A method for eliminating surface roughness of an object built from a modeling material using a layered manufacturing rapid prototyping technique, comprising the step of:

reflowing a surface of the object by exposing the object to vapors of a solvent that transiently softens the modeling material.

22. The method of claim 21, where the modeling material is a thermoplastic resin.

23. The method of claim 22, wherein the thermoplastic resin comprises at least about 50 weight percent of an amorphous thermoplastic selected from the group consisting of ABS, polycarbonate, polyphenylsulfone, polysulfone, polystyrene, polyphenylene ether,

amorphous polyamide, methyl methacrylate, poly(2-ethyl-2-oxazoline), and blends thereof.

24. The method of claim 23, wherein the solvent is selected from the group consisting of methylene chloride, an n-Propyl bromide solution, perchloroethylene, trichloroethylene, and a hydrofluorocarbon fluid.

25. The method of claim 21, wherein the modeling material is selected from the group consisting of thermoplastics, green metals dispersed in a polymeric binder, green ceramics dispersed in a polymeric binder, and jetting wax.

26. The method of claim 25, wherein the modeling material is glass-filled nylon.

27. The method of claim 21, and further comprising the step of:

masking selected portions of the object surface with a substance that will inhibit smoothing of the selected portions, prior to the step of reflowing the surface.

28. The method of claim 27, wherein the masking substance is applied using an automatic process.

29. The method of claim 28, wherein the automatic process is a jetting process.

30. The method of claim 28, wherein the automatic process is a fused deposition modeling process.

31. The method of claim 28, and further comprising the step of:

identifying the selected portions of the object surface for masking accordingly to their geometry.

32. The method of claim 31, and further comprising the step of:

identifying the selected portions of the object surface for masking accordingly to their radii of curvature.

33. The method of claim 28, and further comprising the step of:

identifying the selected portions of the object surface using a software algorithm that creates a digital representation of the surface area to be protected.

34. The method of claim 33, wherein digital data identifying the surface area to be protected is stored in an .stl file.

35. The method of claim 28, and further comprising the step of:

identifying the selected portions of the object surface for masking using a haptic input interface.

36. A method for making a three-dimensional object comprising the steps of:

providing an initial object representation in a digital format, the initial object representation having a surface geometry;

modifying the initial object representation to pre-distort certain features of the surface geometry, producing a modified object representation;

building an object as defined by the modified object representation, from a modeling material using a layered manufacturing technique; and

vapor smoothing surfaces of the object to produce a finished object, the finished object having a surface geometry that approximately matches that of the initial object representation.

37. The method of claim 36, and further comprising the step of:

identifying features of the surface geometry for pre-distortion according to their radii of curvature.